CONCRETE WORKER'S REFERENCE BOOKS

Molding Concrete Flower Pots, Boxes, Jardinieres, Etc.

By A. A. HOUGHTON

Author of "Concrete from Sand Molds," "Ornamental Concrete Without Molds," Etc.

Being Number 10 of this Series

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MOLDING CONCRETE FLOWER POTS, BOXES, JARDINIERES, ETC.

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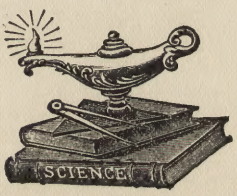
A PRACTICAL TREATISE

EXPLANATORY OF THE CONSTRUCTION OF THE MOLDS FOR AND THE CONSTRUCTION OF VARIOUS DESIGNS OF CONCRETE FLOWER POTS, JARDINIERES AND WINDOW BOXES OF CONCRETE, TOGETHER WITH THE REINFORCEMENT AND SURFACE TREATMENT OF THE CASTS AFTER MOLDING.

By

A. A. HOUGHTON

Author of "Concrete from Sand Molds," "Ornamental Concrete Without Molds," Etc., Etc.



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FOREWORD

IT is the purpose of the writer to present in this series of books a complete explanation of various successful methods of concrete construction that may be employed by the beginner as well as by the more experienced worker. I shall endeavor to give the details of molds and ideas that are not covered by patents, such as may be easily and cheaply constructed; hence the reader is not compelled to purchase expensive patented molds before putting into practise the many successful types of concrete construction I have exhaustively described in this series. There is no practical value to the reader in explaining a patented system of construction, other than a few words on its merits, as the owners of same are always pleased to give this information; hence in going outside the beaten track of concrete authors and presenting ideas, systems, and molds that are practical, successful in operation, and, above all, easily and simply constructed, I trust that I have merited the sincere gratitude of all fellow workers in the concrete field who seek such information.

Yours very truly,

A. A. HOUGHTON.

PREFACE

It is the purpose of the writer to present in this volume details of molding such concrete articles as would be used for holding plants and flowers in the house or upon the porch; large urns and similar concrete casts will be fully treated in the volume devoted to lawn ornaments and garden furniture.

The strength of the work can only be secured by the care given to the preparation of the concrete; after a full explanation of the proportioning, mixing, placing and tamping or "puddling" of the concrete the reader can be assured that he will at least start right, and thus increase his chances of successfully molding the work contemplated.

Another important point is the proper construction of the molds, so to insure that they will have the right draught, or construction, to permit them to part from the cast with the least possible friction or adherence between mold and concrete. The construction of wood and sheet-metal molds, plaster and composition molds, glue, sand, gelatine, and wax molds is also fully treated with detailed instructions for building successfully.

The construction of the cores, as to permit them to be released without danger of breaking the cast, is explained, as well as the proper method of reënforcing to prevent breakage in the casts, a fault so often met with in molding this class of concrete work. The writer has only explained the methods he has successfully employed in actual practice and thus can assure the reader that he will find them of value.

The molding of various designs of flower-pots, jardinières, and other concrete casts employed for this purpose, are fully treated, together with the various methods employed to ornament same. The cardboard system of modeling bas-relief figures and ornaments, as well as the method of inlaying the work with colored tiles, pebbles, etc., is explained. Cutting ornaments into the work after molding, as well as polishing the cast, is explained in detail, which facts the writer trusts will meet with the approval of the concrete worker.

A. A. HOUGHTON.

May, 1912.

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MOLDING CONCRETE FLOWER-POTS, BOXES, JARDINIÈRES, ETC.

Concrete is an ideal material for ornamental casts, as its slow-setting properties enable the worker to place it more carefully and exactly than may be done with plaster or any material with which the initial set takes place within a few moments after mixing with the moisture.

A smooth, dense, and even surface finish must depend upon the mixing of the concrete, the aggregates used, and also upon the careful and intelligent placing within the mold, to avoid "air-bubbles" or small holes in the surface of the cast.

The first requisite is clean and well-proportioned sand or aggregate; this must run from fine to coarse particles, the largest of the coarse aggregate not more than 3/16 of one inch in diameter, and with enough of the fine grains mixed with same to fill the voids, thus securing as dense a mix as possible. Most sands will not have more than 50 per cent of voids and, as the exact percentage of voids can be easily determined by a simple test, the worker can easily make certain the quantity of finer material to add to secure the maximum density to the mixture. The test for voids is accomplished by filling

a cup with either the coarse aggregate or the combined aggregate; if you wish to determine the quantity of cement to use, the net weight of the aggregate is determined, which, to illustrate, we will state was 10 pounds. Water is now added to the cup filled with sand until the cup is level full; this is now weighed and the net weight secured, which, for the purpose of illustrating, we will call 13 pounds. The cup is cleaned and filled with water and the net weight of same secured, or 6 pounds. The combined weight of aggregate and water, or 13 pounds, less

Percentage of voids in sand	Proportion sand and cement as follows:	
	Cement	Sand
19 to 20%	1	3.5
20 to 26%	1	3.0
26 to 34%	1	2.5
34 to 42%	1	2.0

the weight of the aggregate alone, leaves a difference of 3 pounds, or the voids in the aggregate. The voids in the aggregate, or 3 pounds, divided by the net weight of the water contained in the cup, or 6 pounds, gives a percentage of 50 per cent. This is taken as an illustration, as where 50 per cent of voids occur in your aggregate finer sand should be added to bring the percentage of voids down as much as possible.

In determining the mixture to use, the above table may be used, when you have ascertained the percentage of voids in the aggregate.

By determining the voids in your aggregate, you

can then easily secure from the above table the proper mixture to employ of sand and cement, to secure a surface finish that is smooth and dense, as well as a cast that is far stronger, the latter being very essential in ornamental work, as many projections from the face of design demand the maximum strength of the concrete to prevent damage and breakage in handling the finished product.

Where the sand contains from 5 per cent to 10 per cent of finely pulverized clay, it is not a detriment to the successful use of same; in fact for such casts as demand the molds to be removed as soon as work is placed, the clay in your sand is a valuable aid in insuring that the cast will "stand up" or hold together. Where the sand is mixed with any loam or soil, other than clay, it must be washed, otherwise it would interfere with the proper bonding of the grains of sand together.

The cement should be of a standard brand and be free from all lumps. Where there are any lumps in the cement, it should be screened to remove same, as in an ornamental cast the worker should not take chances of decreasing the strength of the work at any point, as would be the result if the cement contained lumps even small in size.

Hydrated lime is of value in increasing the density of your mixture, as well as producing a far smoother surface finish. The proportion to use will vary from 25 to 50 per cent, and should take the place of an equal weight of cement; thus, for instance, if 25 per cent of hydrated lime is added to the mixture, one-fourth the weight of your cement is

replaced by lime, and as this is lighter in weight you are adding to your cementatory material, thus securing a greater sand-carrying capacity for the cementitious part of the mixture. This is of value where there is a large percentage of voids in the sand that you use. In all ornamental concrete work I have always followed the practice of using not less than 25 per cent of hydrated lime, as the cast is less liable to breakage when the molds are removed at once, and also the surface finish is far smoother and less liable to be pitted or filled with small holes.

The mixing of the material should have careful attention, first spreading the aggregate out upon the mixing board as thinly and evenly as possible, then placing the cement upon the sand in an even coating over same. The combined material is then turned and mixed until a uniform color is obtained; if light or dark streaks show, the mixing must continue until the mass is of a uniform color. The water is best added in a fine spray, as from a sprinkler; to dash the water upon the mass from a pail will wash the cement from the grains of sand and so destroy all you have gained by careful mixing. After the moisture is added the mass must be turned until every portion of mixture has the same degree of moisture, if you would insure a cast of uniform density.

Where the concrete is mixed semi-dry, as used for blocks and brick, the mold must be planned so that the strokes or pressure of the tamper will be downward upon the face or any projecting part of the cast, thus ramming or driving the concrete into all

the lines of mold. If the construction of mold will not permit this, a wet mix should be employed, as the semi-dry mixture could not do otherwise than produce a faulty cast.

In placing wet concrete the mold should be poured about one-quarter full, then with a stick that has all corners planed off, so there will be no sharp edges to injure a glue or plaster mold, stir or "puddle" the concrete, thus forcing it into all the lines of mold; the action of "puddling" the concrete forces the air, trapped by the pouring of the concrete, to the surface, as well as all surplus moisture, and thus secures a smoother and denser cast; after an interval of two to three minutes, another one-fourth of the concrete should be poured and thoroughly "puddled," and another batch poured, until the mold is filled. This process may be slow, but it insures a far better surface finish and greater density and strength to cast. By having several molds to fill each time, the worker can thus save time. The operation of completely filling a mold should not be more than 30 minutes; otherwise the concrete first placed will take its first or initial set, or hardening process, resulting in streaks or layers between the several pourings or batches of concrete that are placed.

A rough or pitted surface may result from one of several causes: from surplus moisture in the concrete caused by a mix that is too wet; by air that is trapped during the pouring of the concrete, or by employing a mixture that is not properly proportioned; also by improper mixing, thus placing an

undue proportion of the coarse aggregate at one point without enough finer particles to properly fill the voids between the grains.

CONSTRUCTION OF THE MOLDS

In constructing any mold the worker must plan the division lines to insure that they will have ample draught or construction, so as to enable each section to draw from the cast without any possible danger of injuring same. To insure this result, the division points must be along such lines as will give the least friction or resistance when removing the mold from the cast, and at no point must any section of mold bind or pull upon a projection of the cast, as the least adherence between mold and concrete presents a danger of detaching a portion of the work, when drawing the mold. Each mold must part from the concrete surface absolutely without friction, or sticking, and the molds should be planned so that this is assured; otherwise it would be impossible to secure a perfect concrete cast.

The correct method of making the vertical division lines for simple cylindrical molds is shown at (*a*) in Fig. 1; by making the mold in three equal sections, vertically, there is no possibility of failure in securing a mold that should draw from the cast without injuring same. When a mold of this kind is divided in halves, it is always possible that the division line will not be in the centre, hence one section will cling or stick to the cast.

This rule will apply to all simple circular molds,

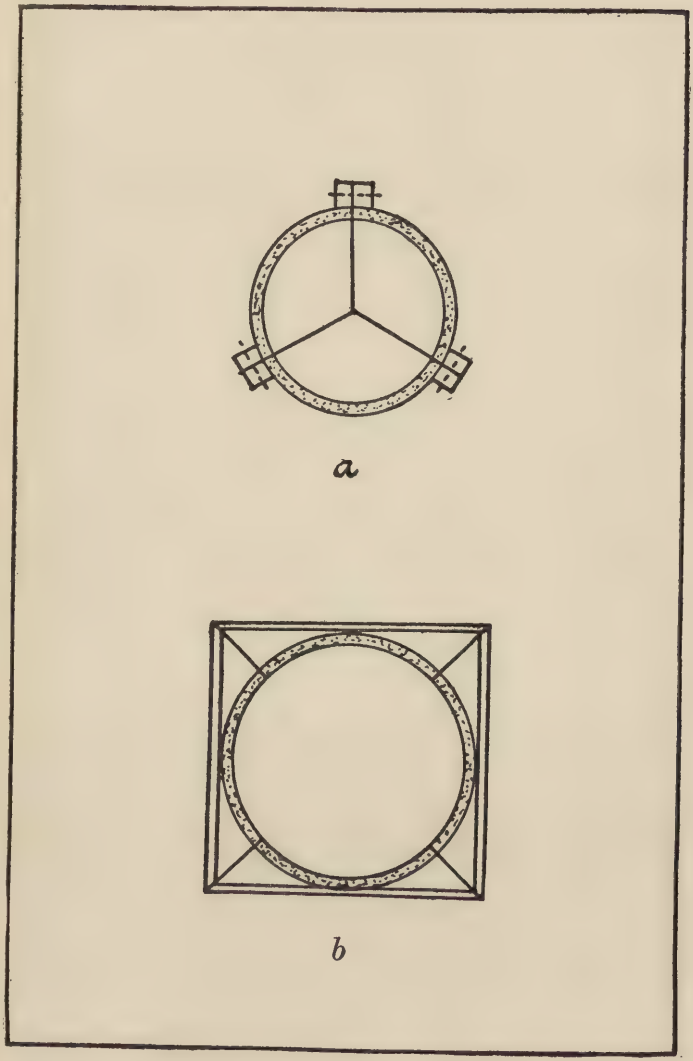

FIG. 1.—Division of Concrete Molds, Circular and Square.

as the usual projections can be so planned that their greatest length will come at a division point, or in such a position between division points that the mold will not stick to the work.

Where the circular model is made up of wood moulding, beads or ornamental bands and half-hollow members, the mold should be divided into quarters, to insure that all faces of mold will have ample draught to part from the mold freely and without danger of injury.

As illustrated in Fig. 1, at the point division line is placed a projection should be molded, or attached; thus this projection can have two holes drilled in same before the mold is cut apart along the division lines you have planned for it. Then when the mold has been divided, the placing of a bolt or pin through these holes insures that the mold will be placed together exactly as it was molded.

The usual division line of a square mold is at the corner, as this insures more perfect results when the mold is a cast from a model composed of wood mouldings; this is more clearly illustrated by the drawing at (*b*), Fig. 1. This method of dividing the mold permits each section to be drawn in a direct line away from the face of the work, so that any under-cutting or projections upon the face of the cast will not cling to the mold.

This is also of value when the mold is enclosed in a supporting frame, for assembling same, as the joints in the wood or iron supporting frame are at the same point as the outside joints of the plaster or composition mold.

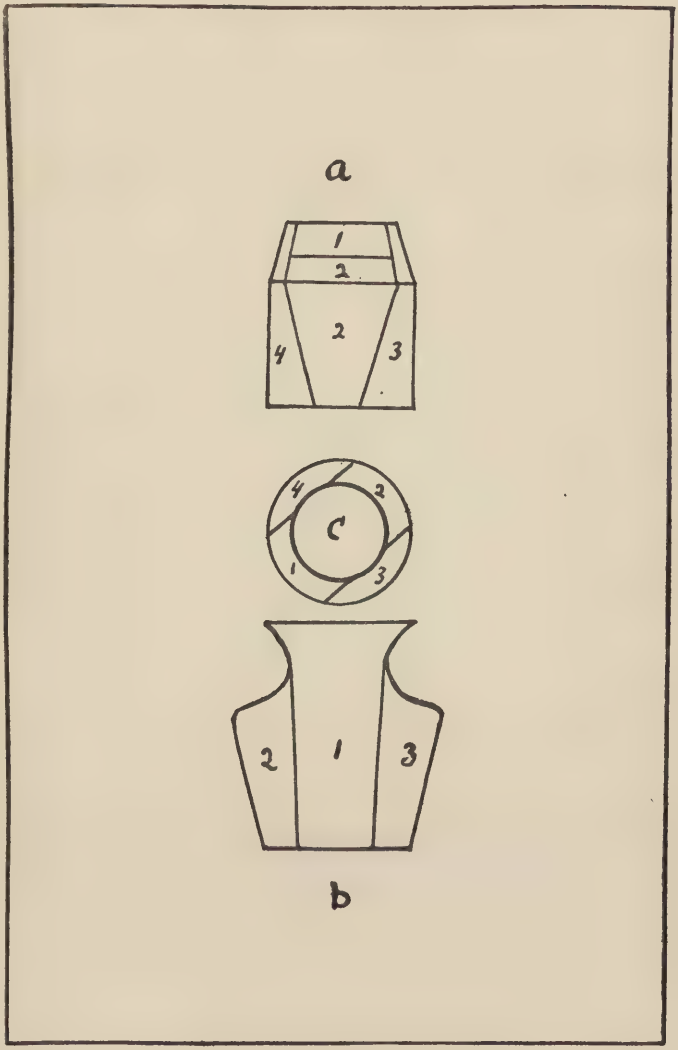

FIG. 2.—Method of Dividing Cores.

CONSTRUCTION OF THE CORES

The construction of a square core form is shown at (*a*), Fig. 2. As will be noted, the various parts are fitted together with diagonal joints, thus forming wedges to make up the centre of core. This permits the parts 1 and 2 to be drawn with ease, allowing parts 3 and 4 to be drawn toward the centre of core opening and thus released from the work. This method of dividing the core can be applied to many forms of cores, in addition to those made in the form shown in illustration.

At (*b*) in Fig. 4 is shown a form of core, where the main body of core is larger in diameter than the neck of the opening, from which it must be removed. This core is easily removed by making the centre, or part 1, as shown at (*b*), a circular and tapering wedge; this is easily drawn from the work. The parts 2 and 3 are now shown at (*c*), in Fig. 2; as will be noted, they are divided so that the parts 1 and 2 can be drawn toward the centre of opening left by removing part 1, as shown at (*b*), and as these parts are no larger than neck or opening to vase, they can be easily removed, thus releasing parts 3 and 4. By not making any part of core larger than the neck of the urn, it is easily possible to use this, or any other form, and easily release same from the work.

The cores may also be made from sand, tamped into a mold, packing same hard enough to stand up while the concrete is poured around same; also by using from 25 to 45 per cent of finely pulver-

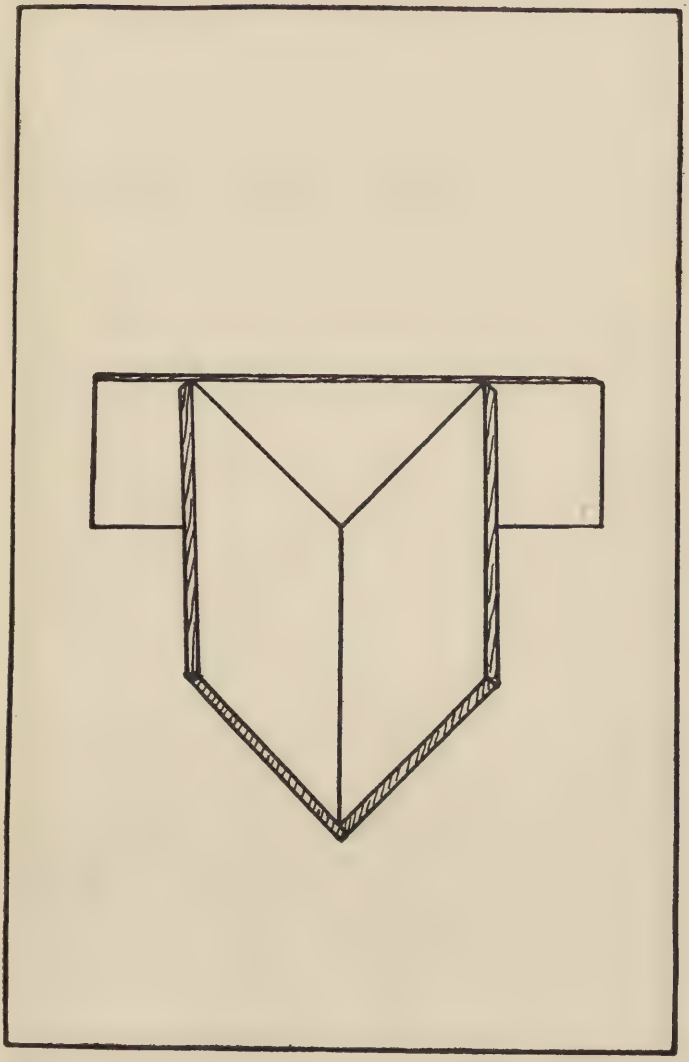

FIG. 3.—A Simple Method of Molding Sections of Plaster Molds.

ized clay with your sand for cores; the clay will act as a temporary cement or adhesive in holding the sand together, yet when the moisture dries out from the sand it will not prevent the sand core from being broken to remove from cast.

Where ample draught is possible for core, sheet metal can be successfully employed for same; these can be made at a low cost by any tinner, and will be far better than a core of any other material, wherever possible to employ same.

PLASTER AND COMPOSITION MOLDS

Other than metal, plaster and plaster compositions are the most universally employed as the material for molds to produce ornamental casts, where but a few are required. If a large number of casts are demanded from a single mold, it is always best to have the mold made in metal, as plaster and all similar mold material cannot be depended upon to make more than a few perfect casts without breaking, warping or becoming damaged by the placing of the concrete within same.

Plaster of Paris makes a very smooth mold and is easily handled, but the mold, when the plaster alone is used, is very delicate and fragile, demanding care to secure even a few casts from same.

However, if from 4 to 8 per cent of powdered marsh-mallow root is added to the plaster, it will secure for the concrete worker a composition that sets very slowly, and when hard is very tough and durable, retaining all the clear-cut lines of the

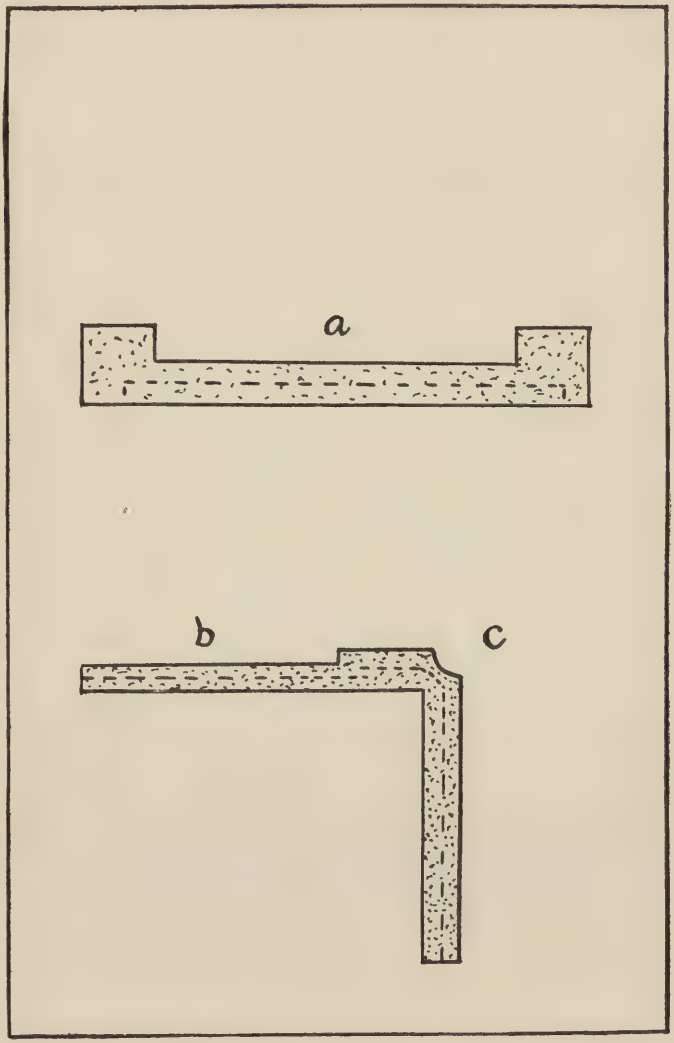

FIG. 4.—Reënforcing Concrete with Wire Cloth.

plaster of Paris mold, with several times the durability and strength. The marsh-mallow root should be finely pulverized, and most thoroughly mixed with the plaster; this is best done by passing both powders through a sieve several times. The composition is then mixed with water, as employed for ordinary plaster of Paris, and placed in the position desired for mold or model, according to its intended use.

In using 4 per cent or four pounds of the powdered marsh-mallow root with each 100 pounds of plaster of Paris, the setting of the plaster is retarded for from 30 to 40 minutes, and may be worked into shape, or modeled during that time. The cast is very hard and quite durable.

Where 8 per cent or eight pounds is mixed with each 100 pounds of the plaster, the hardening or set of the plaster is retarded for from 50 to 80 minutes and the resulting cast is a very hard and durable mold that can be sawed or carved at will and which can be polished down very smooth by friction.

As the setting or hardening of the plaster of Paris is greatly retarded, the worker can shape the plaster as he may desire, thus securing a mold that will be far more perfect, as well as one of greater strength and durability.

All unused composition must be stored in a dry, warm room, otherwise it will become lumpy if exposed to very little moisture.

The mixing of glue with ordinary plaster of Paris also retards the hardening or set of the plaster, making a mold that is far more durable than the

plaster of Paris when employed alone for the casting of mold. The glue is the best employed when dissolved in the water used to wet the plaster; by using the ground glue a size is quickly made, and thus the glue is thoroughly mixed with the powder.

The ordinary wood-fibre wall plaster, as sold at all lumber yards and by other dealers, is another excellent material for concrete molds; this makes a cast that can be cut or sawed as the worker may desire, also can be worked down with chisel and sandpaper to a very smooth surface. This is advantageous for the reason that it is very low in cost and the mold is strong and durable, permitting a number of casts to be made from same when properly reënforced; yet to perfect the mold demands some skill, as the wood-fibre plaster is very apt to ruin the mold by sticking to the model, unless care is taken to provide a perfect non-adhesive coating between model and the plaster for mold. The most perfect coating for this purpose is melted paraffine wax; this is applied hot, with a brush, over the surface of model; the wax hardens as it cools, forming a thin film of wax entirely over the surface of model; this wax film lifts with the plaster cast or mold and is easily removed by placing the section of mold in an oven and allowing the wax to melt and run out of mold section. Several good coats of shellac will also prevent the cast from adhering to the model; for this purpose the shellac must be rightly made, as the usual prepared shellac at paint stores will not do for this work any more than it will work upon patterns in an iron foundry. The

safest way is to purchase the gum shellac and dissolve or "cut" it with wood alcohol; denatured alcohol will not work as well; this process takes about 15 to 30 minutes to enable the alcohol to dissolve all of the gum shellac that it will; the result is a composition far thicker, or with more body, than painters use. When this is spread upon the mold, pattern, or model, a hard durable coating results that is absolutely non-adhesive, as well as positively waterproof. The advantage of using a compound that can be applied with a brush is that every part of mold can be evenly coated, while with models or molds of irregular lines, to coat with a paste or grease would not result in an even coating, thus causing defects in the plaster cast taken over same.

In casting plaster molds a thin mixture should be placed upon all parts of model, where the lines are such that a stiff mortar could not be forced into same. Where the model has a circular surface, it will be necessary to mix the plaster quite thick or "stiff" and plaster over the model, building up the plaster wall upon the projecting parts of model.

An easy method of molding quarter segments of any circular mold is shown in the illustration at Fig. 3; this is simply two boards nailed together, with a board at each end, so that the space between same is an exact quarter segment of the circle desired for mold; the model is placed inside the two boards and the plaster placed over model; thus the cast will have edges or joints that will be exact, or

a square mitre, when the four sections of mold are fitted together.

This is of value where it is not desirable to make a complete model, and thus by making a quarter section of model, and casting mold in this manner, the completed mold will fit together as perfectly as if cast in one piece, if your wood form is accurately constructed.

WOOD AND SHEET-METAL MOLDS

There are a large number of various styles of molds that permit of wood construction, where but a few casts are demanded from each mold. With the several styles of wood moulding that are available at all lumber yards, a mold can be built up from the plain square-box form, by inserting strips of the wood moulding cut to fit inside the square-box form, and thus mold a large number of ornamental forms.

The requisites of wood-mold construction are: lumber that is not apt to warp or check,—for this purpose whitewood is best, as when kiln-dried there is the least percentage of danger from the moisture in the concrete affecting the wood; the lumber should be straight-grained and of sufficient thickness to withstand the pressure of the concrete placed within mold, without bulging or springing from position. White pine is also an excellent lumber to use for this work, as it is usually straight-grained and does not have the tendency to curl or warp that some other woods have.

Another requisite of the wood mold is close-fitting joints; these are best made with a square mitre; thus if it is desirable to add wood mouldings inside the square-box form it can be more accurately fitted to make a perfect corner. The joints should never be nailed together, unless permanent, as the drawing of the nails would be liable to injure the concrete cast. By fastening with screws they can be taken apart without any jar or vibration to the cast. By nailing two strips to the two boards that meet at corner a small clamp can be used to hold the corners together, and by providing some method so that the joint or boards cannot slip, this makes it very easy to release same, without danger to the concrete cast.

The wood mold should be well coated to prevent the moisture in the concrete from affecting the wood; this is done by covering the surface of mold with at least two good coats of shellac. Paint is not a success, as there is a tendency to peel caused by the moisture coming in contact with the paint. Do not make the mistake of using a wood mold without first covering the surface with some non-adhesive coating, as the minute particles of cement will penetrate the wood and thus cause the concrete to bond to same, causing pieces of the cast to break off when the mold is removed. If not desirable to use shellac, when but one or two casts are to be secured, then paint the surface of mold with coal oil or kerosene, giving it a liberal coat just before filling with concrete, before each cast; this will avoid trouble in adhering or sticking and if the surface of

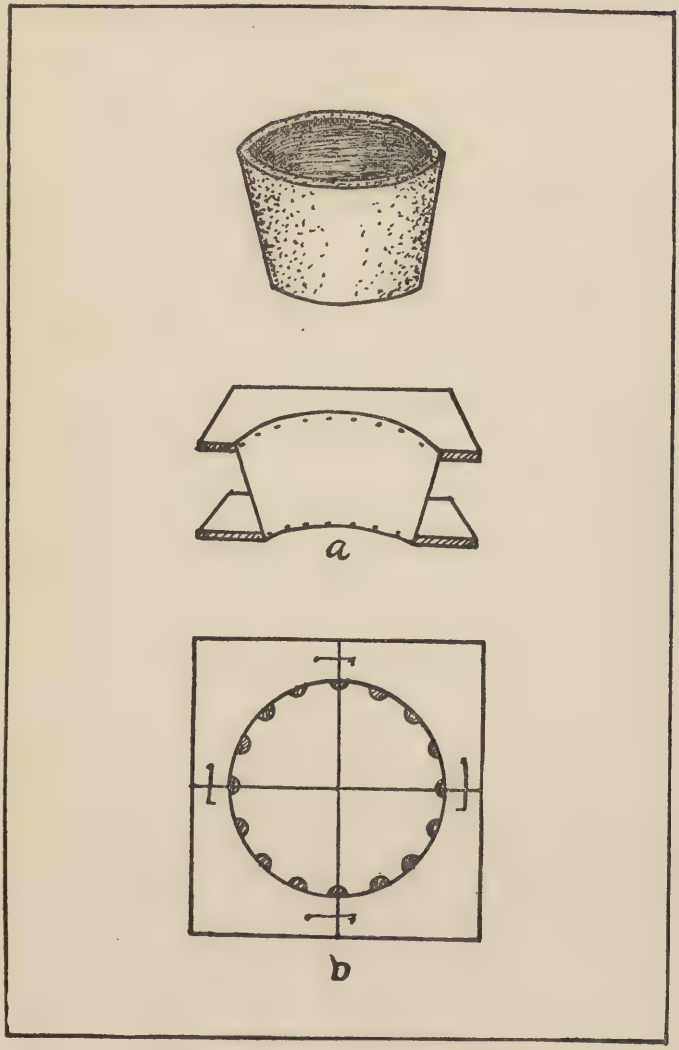

FIG. 5.—Molds for Concrete Flower-Pots.

wood is smooth the cast will have a very smooth and perfect surface finish.

Many ornamental molds can be built using wood forms to secure the shape of the cast and then covering them with tin, or any other sheet metal; this is illustrated in Figs. 5 and 6.

The outline of the work to be cast is cut from a board, as shown for the circle at (*b*), Fig. 5; sheet metal is then cut and bent to fit inside the outline cut from the boards, to which it is nailed, thus making a mold that has a metal surface exposed to the concrete. The wood supporting form also serves to hold or "lock" the mold together, as a fastening can be more easily attached to the wood frame than to one of sheet metal. For all cylindrical molds enough semicircles must be cut from the boards to prevent the sheet metal from bending or being forced out of place from the weight of concrete placed against same; thus for molds 12 inches or so in height a board at top and bottom will be sufficient, while for molds of greater height the wood semicircles should be placed about 12 inches or so apart, unless very heavy sheet metal is used.

Another type of work that can be advantageously cast in a sheet-metal or wood mold is shown at Fig. 8; the legs or stand for the plant box are easily produced with such a mold. This simply requires that the outline of the outside of stand be cut from the boards, cutting two for each side, then line this with a strip of sheet metal of the required width and provide fasteners to hold the two sections apart. The core or section to mold the opening is then cut

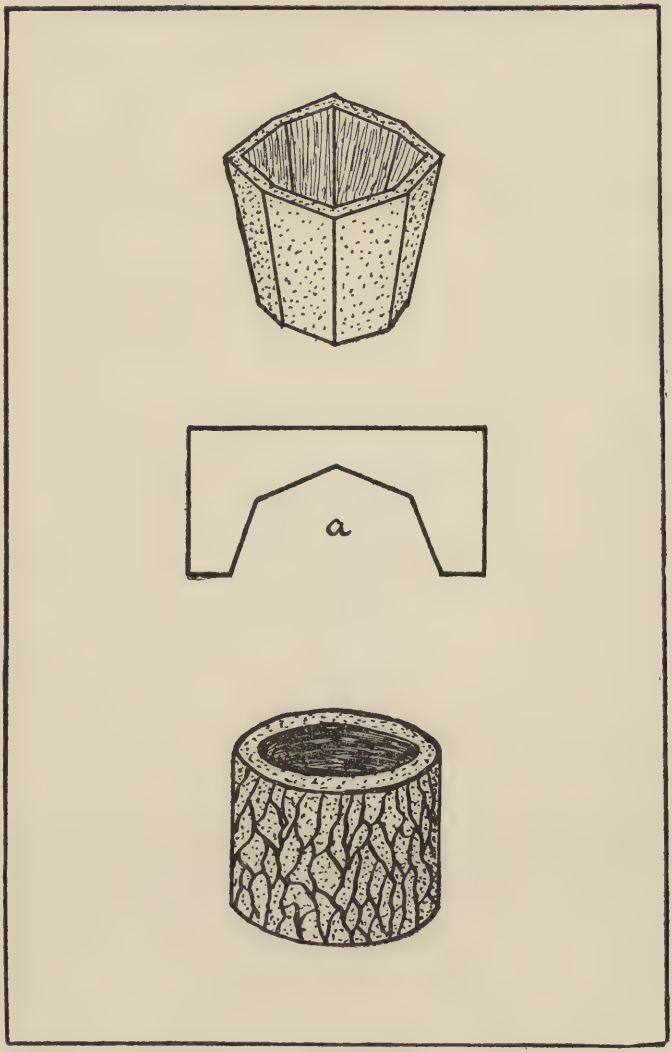

FIG. 6.—Octagonal and Other Designs of Flower-Pots.

and the outside edge of same covered with the sheet metal, cutting the lower section slightly smaller than the top part of core, so as to give the form enough draught or taper, so it will draw from the concrete without injury to same.

If you wish perfect casts, do not make the mistake of using grease or oil with a heavy body upon sheet-metal molds. Simply brush coal oil or kerosene over same before each cast, and the parting between cast and mold will be perfect and with a smooth even surface.

GLUE, SAND, AND WAX MOLDS

A glue mold is rather difficult to make and requires considerable care to have perfect.

The model should be oiled and then coated with modeling clay to a thickness of at least $\frac{1}{4}$ inch; over this a plaster shell is modeled, when the plaster is hard; it is then removed and the modeling clay carefully scraped from the model, which is again oiled preparatory to molding the glue mold.

The plaster shell is now "gated," or provided with an opening at the top or above the highest projection to model, also with several small vents or outlets for the air to escape while the glue is being poured; these should be about $\frac{1}{8}$ inch in size. The plaster shell is now placed over the model and fastened in position, so it cannot be moved by the action of pouring the glue cast.

The glue used should be of good quality and is soaked in water for 20 to 30 minutes, then placed in

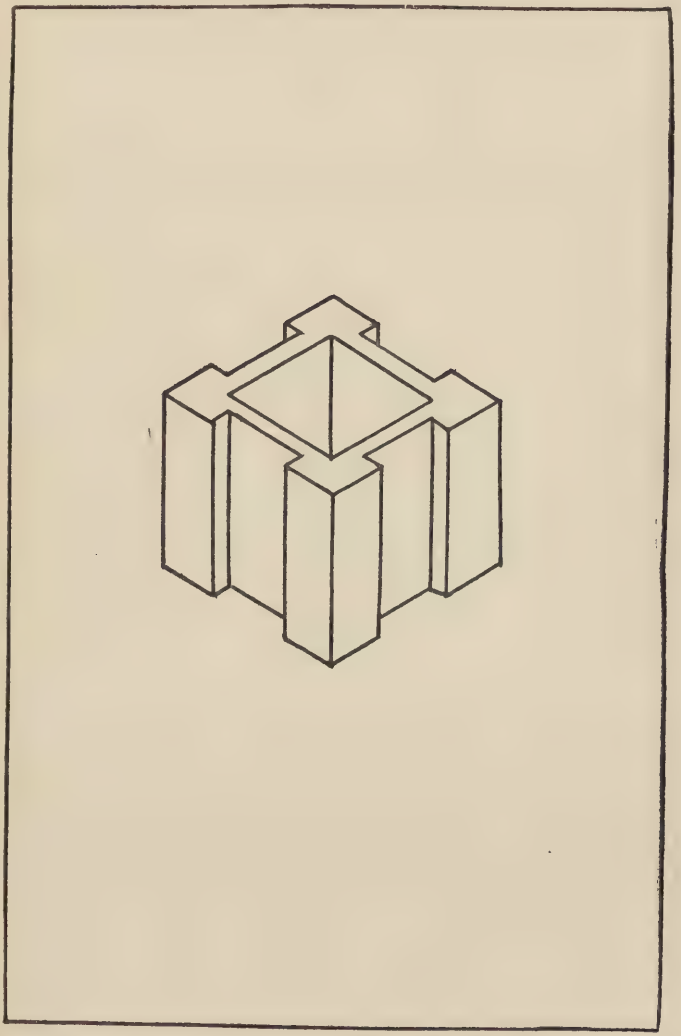

FIG. 7.—Concrete Window-box or Jardinière.

a small pail and this pail in turn set inside a larger pail partly filled with water, and exposed to heat. As soon as the glue has melted to the consistency of thin molasses, place a funnel in the "gate" or opening at the top of plaster shell and pour in the glue; it will run from the small vent-holes in plaster shell as you proceed, thus showing that the glue is flowing properly; these can be stopped with a small piece of modeling clay as the glue is poured. The plaster shell is poured full, or until the glue runs out of the highest vent or fills the funnel.

The glue mold must have at least 12 hours' time to harden, when the plaster shell may be lifted off and the glue mold cut into sections with a sharp knife, using care to have these lines of division sharp and perfect; with molds of slight relief or projection, the glue will not require these division lines, but where the projection is such as would make it difficult to lift the glue mold from the concrete cast, it should be so divided that it can be drawn easily.

For casting in concrete, place the sections of glue mold inside the plaster shell, which should be made heavy enough to withstand the strain of the concrete poured into the mold; then with several coats of any flexible varnish or two or three coats of an alum solution, paint the surface of the glue mold, so as to make it as near waterproof as possible.

Casts from glue molds should be made by pouring, mixing the concrete semi-liquid, and pouring from a pail, carefully "puddling" or stirring with a round cornered stick during the operation; as to tamp a semi-dry mixture into a glue mold would be

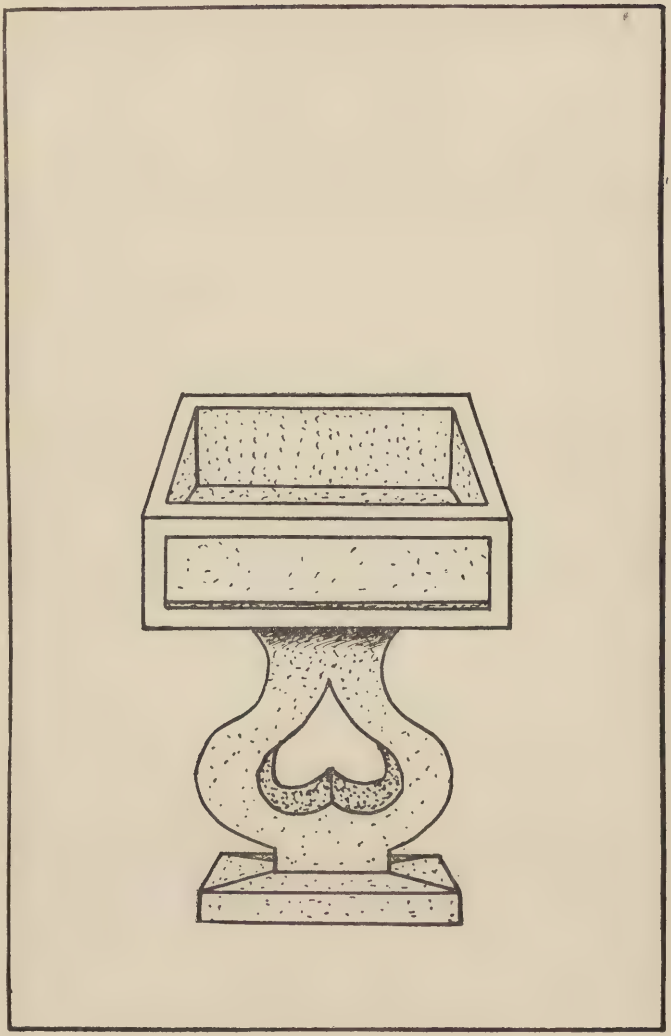

FIG. 8.—Concrete Flower-box and Stand.

almost sure to damage same, resulting in an imperfect cast.

In constructing a sand mold for molding ornamental concrete, a box form is built to hold the sand; this is several inches larger each way than the model or pattern; the pattern or model is placed upon a molding board or pallet and the box form placed around same; then, by mixing fine sand with from 25 to 50 per cent of finely pulverized clay and slightly dampening the mass, it is rammed or tamped into the box form over and around the model. As soon as the box is filled, a pallet or board is placed upon the top of same and the whole thing turned over; then the molding board or pallet is lifted off and the model or pattern drawn from the sand, leaving an imprint of same in the molding sand; this is filled with a concrete, which is left in the sand mold to set or harden until thoroughly cured. The wet sand acts as a blanket around the cast, preventing it from drying out too quickly, and thus aids in perfectly curing the concrete.

While this is a general outline of the method of molding ornamental objects with sand molds, yet other styles of models demand different treatment; all of which are fully explained and illustrated in my work entitled CONCRETE FROM SAND MOLDS, which more fully explains this important subject to the concrete worker than would be possible in this small volume.

Gelatine and wax molds are of use to the concrete worker who desires a mold to produce great accuracy of line, with clear-cut, sharp details, and where the

limited number of casts would not warrant the making of a metal mold.

The best method of making a mold of either sheet gelatine or paraffine wax, is to use a plaster shell and proceed in the same manner as for a glue mold, previously explained; the gelatine mold is more expensive than glue, but makes a very good mold for many purposes. The paraffine-wax mold is useful where the indentations are such that it requires the wax to be melted and allowed to run from the cast; cores of this material can be molded separately and when surrounded with the concrete cast, the work can be subjected to just enough heat to melt the paraffine wax, allowing it to flow from the core opening; in this way almost any cast can be produced, if the core opening can be made $\frac{1}{2}$ inch or more in size and the cast be such that it can be easily subjected to heat sufficient to melt the wax.

As previously stated, all plaster, glue, wood, and similar molds are useful only as temporary molds, where but a few casts are required, or "waste molds" as they are termed by the concrete worker; if a large number of pieces are to be used it is far better to have the mold reproduced in metal, which can be done at your local iron foundry, from your pattern or plaster mold from model, requiring that you simply trim it down, to reduce the weight; then coat with several coats of good shellac.

REËNFORCING THE WORK

The illustration at Fig. 4 fully explains the necessity of some reënforcement for such concrete casts as have a thin wall or body between heavy corners, as illustrated in the square jardinière at Fig. 7.

The weight of the heavy corners are certain to cause a break in the thin curtain wall between same, unless this is reënforced with woven wire or some similar form of metal. Also where a thin wall of concrete is placed between two heavier masses of mortar, the tendency is that the shrinkage or contraction, caused by the drying or hardening of the concrete, will exert a pull or strain upon the thin wall, and unless this is fully reënforced to withstand this stress, a rupture is sure to occur.

The panels of all concrete casts, where the thickness is 1 inch or less, should be reënforced, as shown at (*b*), Fig. 4. The reënforcement of the corners of the cast are fully illustrated at (*c*), Fig. 4, the dotted lines showing the placing of the reënforcing material. As will be noted in all thin walls for square or oblong casts, the woven wire is placed nearly in the centre of the wall, unless the stress is such as to demand that it be placed at one side; while at the corner the reënforcing material is placed as near as possible to the outside surface of the corner, so as to permit it to be covered by the concrete and also to be firmly anchored in same. This is done for the reason that the initial rupture to all concrete work caused by expansion in all forms, is upon the outside of the work; thus where the reënforcing

material is placed next to the inner surface the break in the concrete wall simply causes the metal to bend and does not exert the stress or pull upon same, as if it were placed at the point where the initial break must occur. In the construction of many classes of concrete work the writer has observed the truth of this principle, as circular tanks of concrete, subjected to the strain of freezing water, have successfully held when the reënforcing material was placed as near as possible to the outside circumference; while those in which the reënforcing material was embedded in the concrete as near as possible to the inner circumference cracked under the same strain, and as theory is only the result of successful practice, the writer has adopted this system for all work where it can be successfully employed.

The best material for reënforcing small concrete casts, is the No. 20 woven-wire cloth, as this can be the most readily cut and bent into the form desired. Metal lath can also be employed as reënforcing material, but is not as easily handled as the wire cloth. Where but a single ring or band is needed at one point of cast, a wire will do very nicely and as this can be easily cut and shaped for the work, it will meet with the approval of those who want as cheap a form of reënforcing material as possible. Where light wire is used, two strands twisted together should be used; this bonds more securely with the concrete than if a single strand of heavy wire was employed.

REMOVING THE WORK FROM THE MOLD

Where the casts are allowed to remain in the mold to set or harden, it will often result in the surface "scaling" or breaking off, unless care is employed to loosen the work from the mold before drawing away the mold. This is best done by lightly tapping or striking the outside of mold with a hammer; go over the surface of mold, striking light blows, as soon as the joints are partly unfastened; this will prevent pieces of the face of cast from breaking or clinging to mold, as often happens when the sections of mold are drawn away from the concrete by the time-honored method of using "main strength and awkwardness" to accomplish the work.

FLOWER-POT MOLDS

Four styles of flower-pot molds are shown in the illustrations at Figs. 5 and 6; that shown at (*a*), Fig. 5, is very easily constructed by cutting for each half of mold two boards, with a semicircle cut from each one; that intended for the bottom of mold should be smaller than the other, to correspond with the taper or slant desired for the pot. The inside of the semicircles should be lined with a tin or sheet metal strip that is the height desired for the completed flower-pot.

The two sections of mold are held together with hooks or clasps, while the mold is filled with concrete. The core is easily constructed of sheet metal, as for this work it only demands a cone or funnel-shaped

form of metal, which is held in position by a rod through same and resting upon the top edge of the mold.

This mold can be made more attractive by fluting same, as shown by the illustration at (*b*); the sections are so divided as to make the mold in quarters, and at equal distances apart along the inside surface half-round pieces are fastened to the inside surface of mold, thus imprinting their outline in the concrete of cast.

This can also be applied to a panel form or ornamentation, attaching the mold for the indented panel to the inside surface of the sheet-metal molding surface and so imprinting the panel into the concrete.

At (*a*), Fig. 6, is shown the outline of a mold for an octagonal flower-pot, constructed in the same manner; the sides of this mold are easily made of strips of sheet metal or light boards, cut to fit into the spaces between corners in the octagonal board used as an outline of the mold.

This style of mold permits each one of the sides to be ornamented with a panel, or strips of wood moulding can be cut to fit around upon the inside of mold, as desired, the plain surface to the sides easily permitting the special ornamental faces to be attached to the molding surface.

Another form of flower-pot or jardinière is shown in the illustration at Fig. 6; this is an imitation of a log of wood, and is easily made by taking as the model a block of wood, of the right size, and cutting it into quarters, then by smoothing the bark upon outside surface, and cutting the lines or breaks in

same slightly deeper, so that they will show up plainly in the concrete cast; you have perfected an excellent model, which only requires several coats of shellac, before making a plaster mold from same.

The model or quarter of log is placed in the form shown in Fig. 3, and the plaster placed over the face of same; in this manner making four sections for the complete mold. These should be well coated with shellac so that the concrete cannot adhere to the lines of mold, and with a sheet-metal cone or core to mold the inside of bowl, the mold is complete.

FLOWER-BOXES OF CONCRETE

The molds for a large number of ornamental flower-boxes or window-boxes of concrete can be designed and constructed by the concrete worker, as it is very easily and simply done.

A very pleasing design, as well as a most simple one, is shown at Fig. 7. This requires a square-box form of a size to include the outside corners; in the centre between the corners the projection to mold, that produces the indented part of cast, is attached upon each side, thus with the square-box core form completing the mold for this jardinière or window-box, as it may be classed.

This style of mold permits of being constructed square, as illustrated for a jardinière, or oblong, where it is desired for a window-box for flowers. The design also permits of a number of variations to suit the wishes of the worker.

A panelled design for a window-box is shown in

the illustration at Fig. 8; the mold for this is constructed in a square-box form and with the boards to mold the panels upon four sides attached to the inside surface of mold. The core is a square box, and should be constructed with enough draught or taper to permit it to be easily withdrawn from the concrete.

The stand illustrated with this style of window-box is molded with sheet-metal strips, nailed over boards cut to conform to the desired outline of stand, as has been previously explained in this volume.

By employing the methods explained in constructing these window-box molds, the worker can produce a large number of designs as well as attractive stands for same, as the illustrations will suggest other ornamental forms that he can easily make in practically the same manner, and which will be fully as pleasing.

The walls of window-boxes, where less than one inch in thickness, should be reënforced with woven wire, as previously explained.

CARDBOARD MODELS FOR ORNAMENTAL WORK

It is often desirable to produce a spray of flowers, leaves, or figures in relief upon the sides of urns, window-boxes, jardinières, and flower-pots; these the worker may be unable to model in any plastic material, but by drawing or transferring from a printed picture or drawing upon straw-board the outline of the design, the model is easily secured. After the design is complete the straw-board is cut out, with a sharp knife, along the lines of the design;

this is glued to the flat surface of molding board or side of model for the urn or window-box; if the projection is not sufficient when using a single sheet of the straw-board, then cut additional sheets, exactly alike, and glue to the first one, building up in this manner until the desired projection is secured for the design.

After the glue has hardened, go over the edge of the straw-board model with fine sandpaper, working down the edges so that they are slanting enough to give ample draught to the mold to be cast upon same.

The straw-board model is now coated with two or three coats of good shellac, and when this has dried, a form is erected around same and the plaster placed for the mold.

The projecting straw-board model will, when protected with shellac, withstand the moisture in the plaster for mold, thus producing a mold for any face plate that to model in any plastic material would require hours of labor as well as skill upon the part of the worker. It is best to start with some simple leaf, for the first mold, and by observing that the sides of the model have enough slant or draught to permit the mold to be drawn from same, no difficulty will be experienced.

INLAID ORNAMENTATION

A simple and yet beautiful form of ornamenting the surface of your concrete casts is secured by inlaying with colored tiles, cut to the form you wish. These can be arranged to make a mosaic pattern, or in any other form the worker may desire.

One method of doing this work is to cut into the face of mold enough to permit the tile to set into same for about one-quarter of its thickness, where it is desired that the colored tile project slightly from the face of work. The concrete is placed in mold and back of the tile, thus securely bonding it to the main portion or body of the work.

Another method is to remove the mold from the concrete while it is yet green enough to be easily carved; this is best within about 12 to 18 hours after molding; the outline of the colored tile is cut from the face of the cast and this space filled with a rich cement mortar to which about 25 per cent of hydrated lime has been added; the tile is pressed into this mortar and the cement allowed to thoroughly harden before the work is moved.

Pebbles and other small objects can be partly embedded into the face of the work by plastering the inside surface of mold with wet clay, to a thickness equal to one-half the diameter of the pebbles or other objects to be embedded into the face of concrete. The pebbles are then placed in position by pressing into this wet clay coating, leaving enough projecting so that the concrete placed against same can securely bond same to the surface. After the work is molded

and cured sufficiently, the clay is washed away with water, thus leaving the colored pebbles exposed and projecting from the face of the concrete.

CUTTING ORNAMENTAL DESIGNS UPON WORK

A number of ornamental designs may be carved into the face of the molded concrete by removing the molds after the work has been molded for 12 to 18 hours; the concrete is yet "green" or soft enough to permit it to be easily carved.

The pattern or design should be drawn upon a sheet of heavy paper, to the exact size desired; this is laid upon the face of concrete, with a sheet of transfer paper underneath same. By tracing the lines of design a transfer of the pattern will be made upon the concrete, which is cut with a small chisel to the desired depth to bring out the design.

Another method of securing simple outlines is to work the chisel along a ruler, in almost the same manner as one uses a ruling pen with the aid of a ruler to perfect a straight line, in drawing. In this manner the concrete can be cut in various designs, as by using curved guides or boards cut into the form you wish for ornament, the chisel will be accurately guided, and thus perfectly carve the lines of design into the concrete.

FINISHING THE SURFACE OF YOUR WORK

The simplest method is to apply a neat cement coat to the concrete cast after it has partly cured; this should be made of one part cement and one-half part hydrated lime with one part of fine sand or marble dust; this brush coat is made liquid, or about the consistency of thick cream, and applied to the surface of work with a brush. If white cement is used, the coating will dry out a pure snow white and thus greatly add to the beauty of your work, as well as completely filling the pores of the concrete and making a smooth surface finish.

If the work is to be polished, the aggregate must be of such a character as to permit polishing by friction. If marble dust or crushed marble is employed the cast can be made more attractive by rubbing the surface with a piece of felt dipped in a strong oxalic-acid solution; this brings out all the lustre and sparkling beauty of the marble aggregate. The process can be employed at any time after the work is molded, if the concrete is strong enough to withstand the friction or rubbing, without injury to the surface.

After the work has become thoroughly cured, it may be polished by rubbing first with a coarse or No. 16 Carborundum stone, with the surface wet so that the rubbing or polishing will bring the surface to a lather. This is flushed off with water and polished to a smooth even surface with a fine Carborundum stone, using a No. 30; this should be used

while the surface is wet with water, to secure the best polishing results from the stone.

If the surface is rough, it should be covered with a neat cement coat and this ground or polished so as to work it into the surface of the concrete, completely filling all the pores and thus bringing the surface to a smooth even finish. By flushing the surface with water as the polishing proceeds, the progress of the work can be noted and all rough spots gone over again.

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